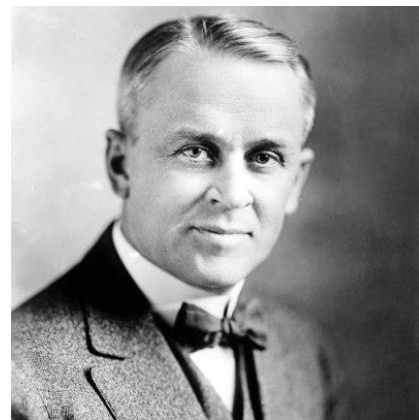


# Spring 2016

## Physics 357

### Intermediate Physics Lab

### Syllabus



*Robert A. Millikan*

**Instructor:** Doug Armstead- Department of Physics  
Bowers 127, phone (607) 753-2919  
Email: [douglas.armstead@cortland.edu](mailto:douglas.armstead@cortland.edu)  
Course website:

<http://facultyweb.cortland.edu/douglas.armstead/S16/Intermediate.html>

**Class:** Tu and Th 8:30 – 11:20      Bowers 139

**Office Hours:** Monday and Wednesday 11:00 – 12:00, Tuesday and Thursday 1:30 – 2:30,  
otherwise by appointment

**Required text:** *Physics 357 Laboratory Manual*, Aphrodite Ahmadi and Richard Wheeler, 2016 edition,  
unpublished. *Will be distributed for free on course website.*

**Recommended text:** *Foundations and Applications of Statistics*, Randall Pruim ISBN: 9780821852330.

**Attendance Policy:** Attendance in the laboratory is mandatory. Four or more unexcused classes (or two experiments) *will be grounds for failing the course.*

**Complementary Courses:** This laboratory complements Physics 203 and 410. Both are useful but neither is a requirement.

**Grading:** Evaluation of Student Grades will be based on the total points accumulated from the following components:

3 Introductory Laboratories	5 percent <i>total</i>
Laboratory Four	5 percent
Nine Advanced Laboratories	8 percent <i>each</i>
Two Laboratories Re-writes	4 percent <i>each</i>
Two In-class Presentations	10 percent <i>total</i>

- Your laboratory reports should NOT simply be a rehash of the laboratory manual. Writing the lab report in LaTeX is *recommended but not required*, MS Word is also

acceptable. You will submit the lab report for the experiment(s) in class at the beginning of the following experiment on a Tuesday, *as well as* email me a pdf copy. The format of the lab report will be similar to the format of a scientific paper. It will have the following sections:

- Abstract: A very short explanation of what you did,
- Introduction,
- discussions sections that include procedures, data acquisition, calculations and the results.
- And finally the Conclusion.

The titles of the sections and subsections can be anything you feel is descriptive of the content except the Introduction and the Conclusion, both of which *must* be labeled as such. The Abstract may or may not be labeled.

- The reports should stand on their own and be readable by any physics student at your level. A few important considerations include:
  1. present the data with appropriate units and all applicable calculations
  2. necessary graphs should follow the calculations and should be done in Excel, R or similar programs
  3. graphical analysis should be used to do regression analysis of data and error analyses should be made for *every* calculated quantity, and
  4. conclusions should be drawn and should be clearly supported by your experimental results.

I will post on blackboard a sample of a real physics paper to follow. I will also post the LaTeX file for it. You may use it as a template to write your own reports. The quality of your reports will be taken VERY seriously by this grader. More papers may be found in the preprints archives: <http://arxiv.org/>

- This course is a writing intensive course, this means that you must receive feedback that you can act on at least twice during the semester. This can take one of two forms:
  1. On two of your lab reports write the paper, get it back graded, rewrite a new draft of the paper based on the feedback and turn this new draft in for a grade.
  2. On one of your lab reports go through two feedback iterations.

In either case what is important is that you show significant improvement from one graded draft to the next.

- The presentations will be ten minutes long. We will follow standard conference formality. Dress semi-casual or formal (no shorts, flipflops or the like) and address your audience as if you have never met them before in your life and they have no idea what you did. You may choose your favorite medium (blackboard, PowerPoint slides, transparencies, pdf's made out of your written lab reports' files etc. Each choice has its pros and cons – talk to me if you are unsure). You will be graded based on many factors, including but not restricted to: the clarity of your discussion, the accuracy of your work, your ability to engage your audience etc.

**Syllabus:**

1a Data Distributions	6 Light and the Laser	12 Three Thermodynamics Experiments
1b Goodness of Fit	7 Properties of Lenses	13 Millikan Oil Experiment
1c Method of Least Squares	9 Viscosity	14 $e/M$ Ratio for the Electron
4 Wave Motion	10 Franck-Hertz Experiment	15 Meteor craters
5 Speed of Light	11 (old 13) Microwaves	16 Heat Engine

**The Schedule:** (Please arrive prepared and read ahead. You may use your laptop in class)

<b>Date</b>	<b>Experiment Number</b>		
	<i>Group Meter</i>	<i>Group Kilogram</i>	<i>Group Second</i>
Jan. 26, 28	1a, 1b	1a, 1b	1a, 1b
Feb. 2, 4	1b, 1c	1b, 1c	1b, 1c
Feb. 9, 11	4	4	4
Feb. 16, 18	5	6	7
Feb. 23, 25	6	7	5
Mar. 1, 3	7	5	6
Mar. 8, 10	<i>Completion of Inquiry Based Extension for Last Lab / Prep for In-Class Presentations</i>		
	<i>First Re-write Due.</i>		
Mar. 15, 17	<i>Spring Break - No class</i>		
Mar. 22, 24	<i>In-Class Presentations of Labs from Mar. 1, 3</i>		
Mar. 29, 31	9	16	12
Apr. 5, 7	12	9	16
Apr. 12, 14	16	12	9
Apr. 19, 21	14	15	13
Apr. 26, 28	13	14	15
May 3, 5	15	13	14
	<i>Second Re-Write Due.</i>		
May 9 8-10am	<i>In-Class Presentations of Labs from Apr. 26, 28</i>		